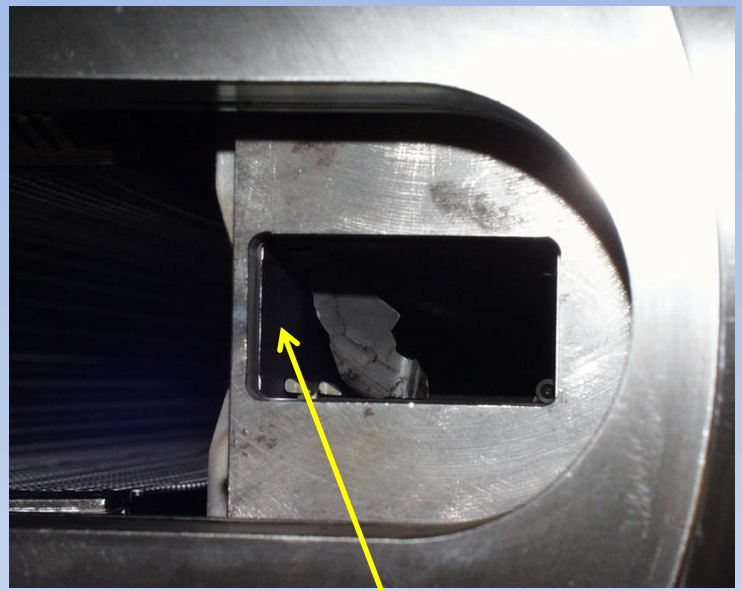
Proposal of a dummy septum to mitigate ring irradiation for the CERN PS Multi-Turn Extraction

....High-activation of the extraction magnetic septum of the CERN PS machine was observed due to the losses of the continuous beam extracted via the Multi-Turn Extraction (MTE) method. The resulting activation is however incompatible with safe operation so a mitigation measure had to be found : the installation of a dummy septum to shield the actual one seems to provide the required reduction in activation in the extraction area. The dummy septum should, in fact, absorb the particles during the rise time of the MTE extraction kickers, reducing the impacts on the thick blade of the magnetic extraction septum. The principle of the proposed modifications of the PS layout will be presented together with the studies aimed at finalising the new configuration.

Septum 16



Septum
Blade

…..Since the region of the septum SMH16 has to be accessible for maintenance and repair, the present situation is far from optimal. A proposal has recently been made during the MTE workshop to strongly reduce the radiation level in this region. The idea is to install a dummy septum blade inside the straight section 15, to shadow the coil in the ‘real’ septum inside the straight section 16.

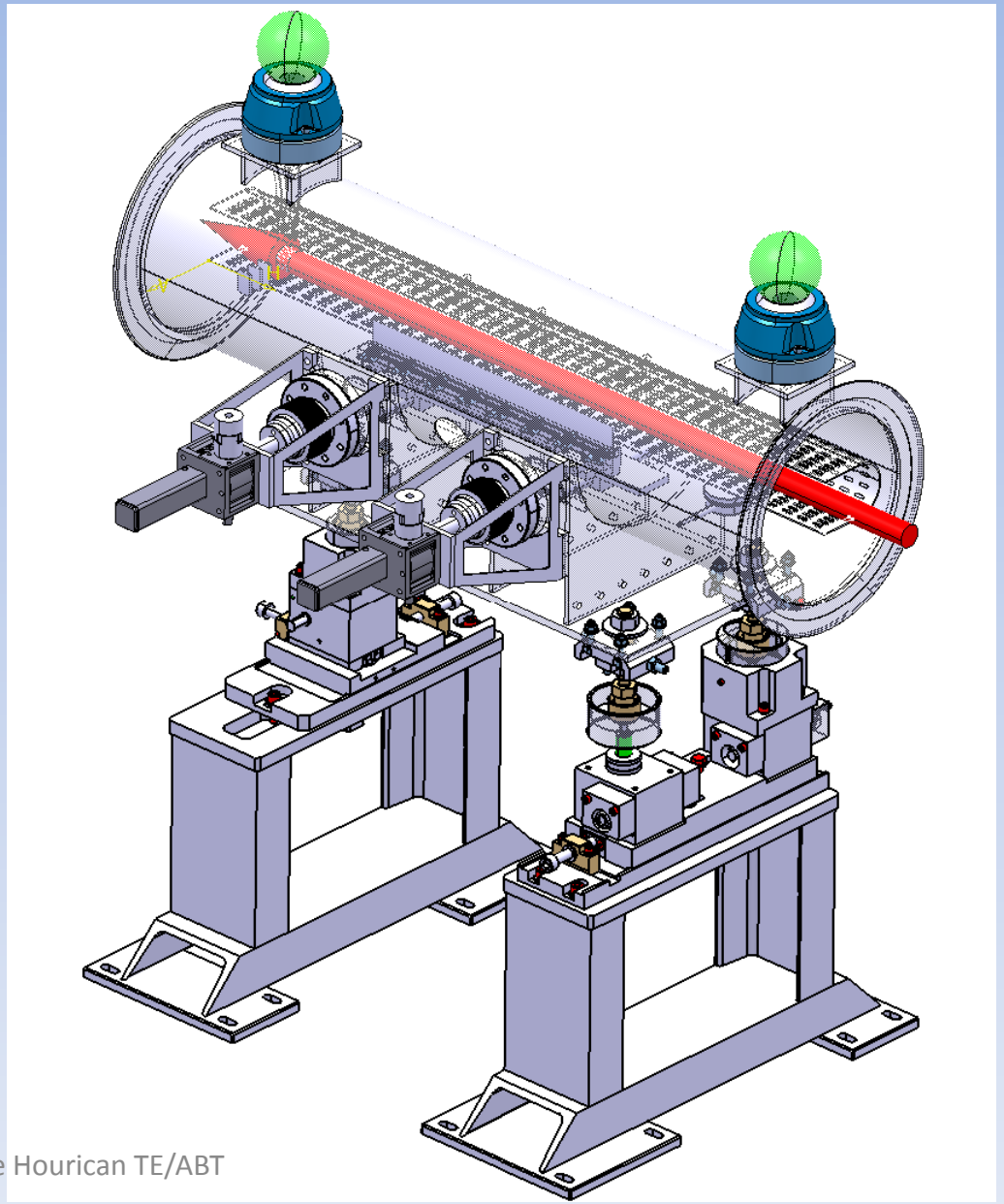
Current Proposal

The new dummy septum, 40 cm long, 3.88 cm high and 3 mm thick blade inside the beam tube.
Copper / Tungsten, - to be confirmed

The wall thickness of the tube is 3 mm, and the material is stainless steel 316 LN.

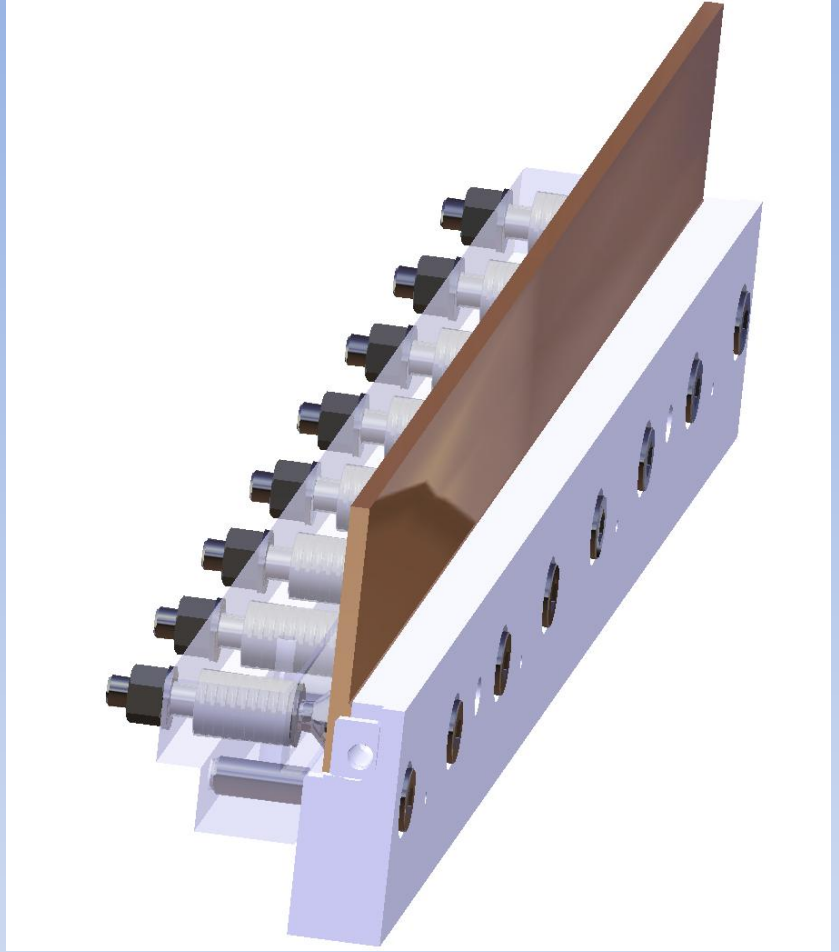
Proposed in report
A vacuum chamber of cylindrical shape with a radius of 10 cm and a wall thickness of 6 mm made also out of stainless steel 316 LN surrounds the arrangement.

Current Proposition (Mike)
Diameter 254/250mm (Wall thickness 2mm)
This is standard tube but can be rolled if necessary with thicker walls

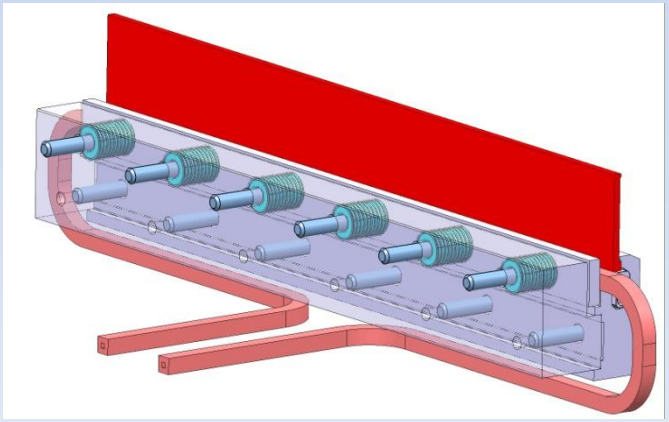


Blade Assembly

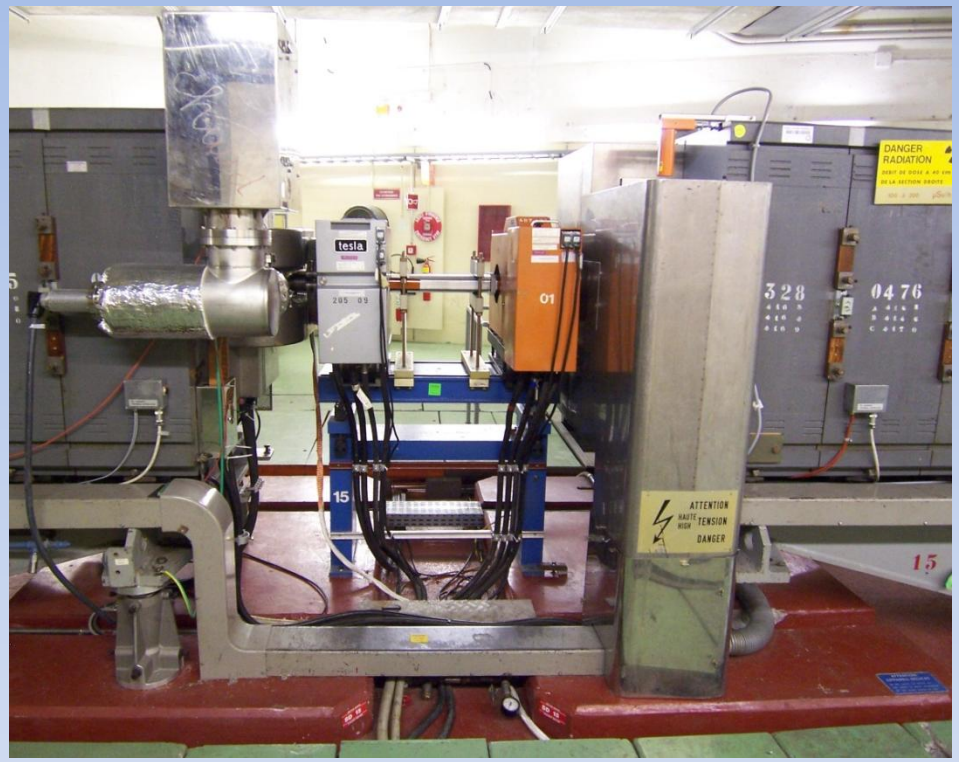
The new dummy septum is conceived to be a 40 cm long, 3.88 cm high and 3 mm thick blade inside the beam tube. Two materials are being considered, copper and tungsten, and one goal of this study was to choose between the two on the basis of the minimal amount of secondary's produced . The blade is placed in the middle of the straight section 15 along the beam direction.



The blade assembly is based on a similar device, TPST, installed in the SPS.
The blade material, to be defined, is clamped by spring pressure in a stainless steel support.
The energy dissipated in the blade can be evacuated using either a conventional water cooling circuit or by using a heat sink connected to an out of vacuum secondary cooling circuit.



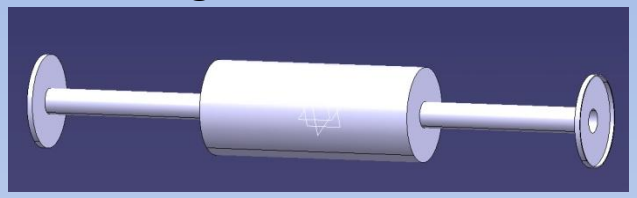
Straight Section 15



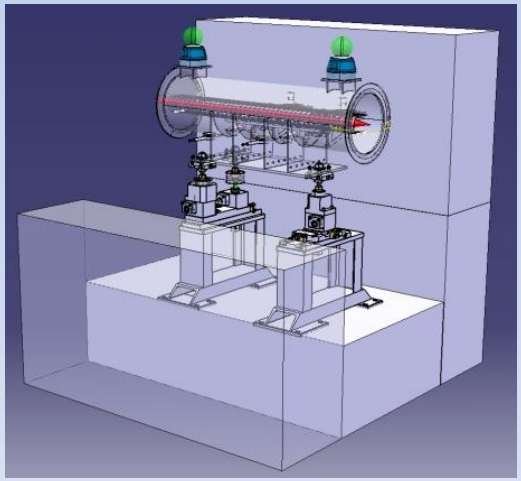
Main Magnet Busbars !
Main PS Support Beam (the “Poutre”) !

“…integration in section 15”

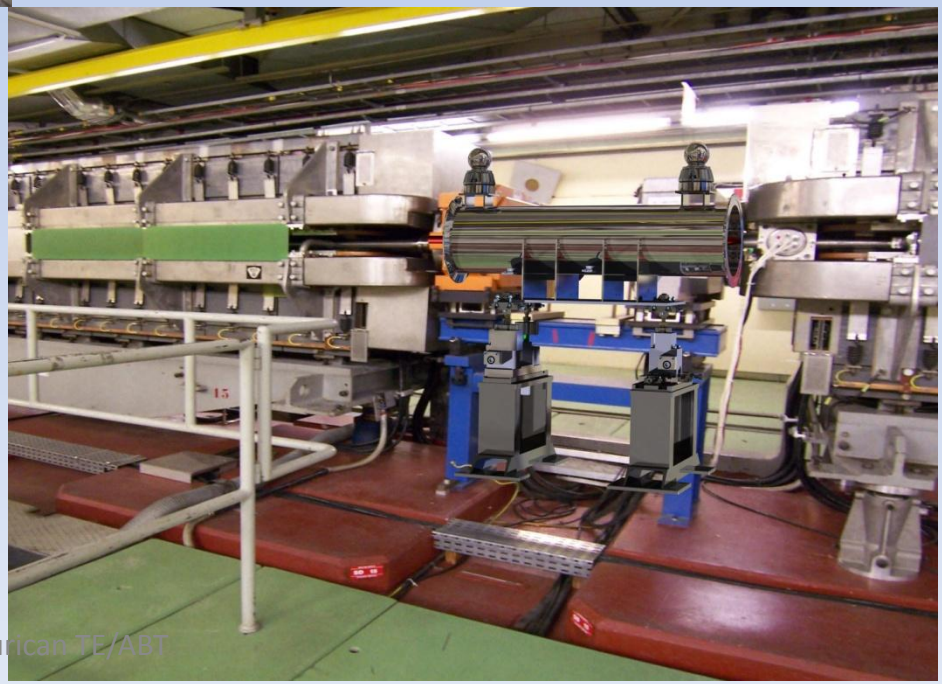
Maybe a better approach would be this configuration…



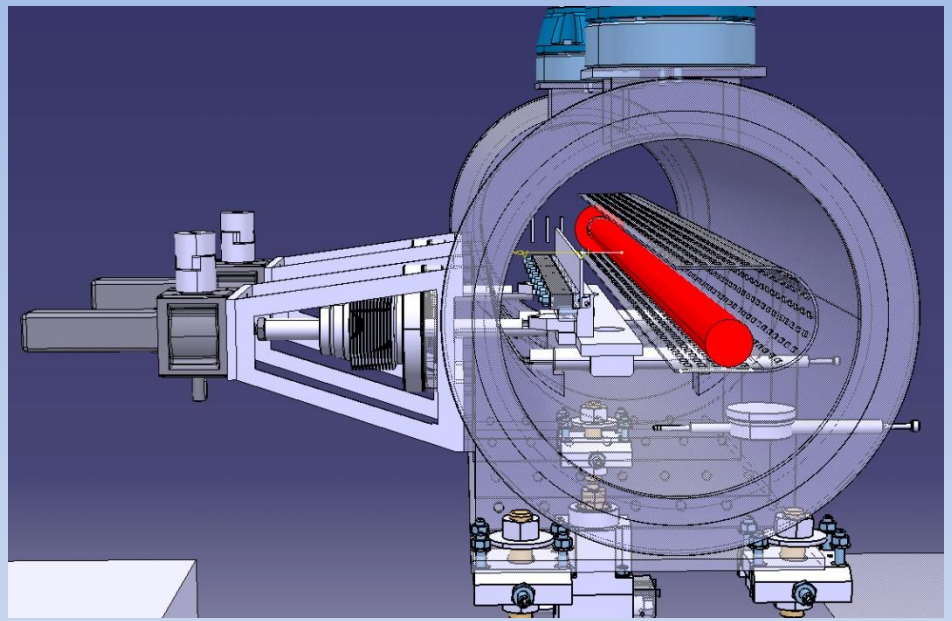
Shielding may be easier to design and be more effective..

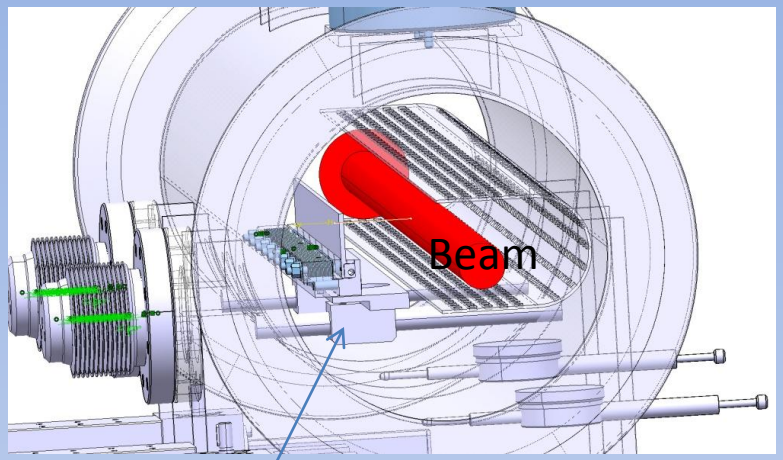


Shielding will not be easy to design.



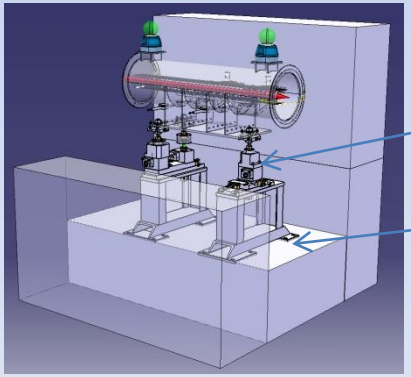
Dummy 15 PS (MTE)





Displacement System

Blade shall be mounted on linear guides to allow for same precision in positioning as on the SMH16. Motor location to be decided.



Supports (design) available in Catia format so no additional design work required.

Lower supports can be dimensioned to allow installation of a shielding block under the supports, to which the lower supports could be secured.

Summary

Define Blade Material

Dimensions of the Vacuum vessel

Vacuum pumping requirements, if any…

Remote handling?

Shielding, where, size, material, support, installation?

Position of Blade, reference system,

Questions ??